physicists with the causes of them, astronomers were interested in the effects of the existence of this isothermal layer, especially in the phenomena of atmospheric refraction. It had been usual to make certain assumptions about the upper air for the calculation of refraction, and these assumptions were now shown to be wrong. Were the refractions calculated on such assumptions wrong? The answer seemed to be that very rough assumptions were sufficient for astronomers; he had found, for instance, that the assumption of two homogeneous shells of air would give empirical results corresponding closely to the facts observed.

Further, no very great improvement was found by adding a third shell—the chief step came in taking two instead of one. Possibly this fact, that two shells were absolutely necessary, but a third was not so much needed, was in some way connected with the existence of two principal regions in the atmosphere.

Prof. J. J. Thomson asked if there was any indication of the thickness of the layer, and remarked that the ionisation in the atmosphere was a maximum at a layer considerably below this layer.

Doctor [Gilbert T.] Walker stated that the Indian peasants were so ignorant that he had not yet ventured on sending up *ballons sondes* there, the chances of recovering them being so remote.

## DAMAGES BY FLOOD AT KANSAS CITY, MO.

Thru an oversight, the statistics regarding flood damage at Kansas City, Mo., were unduly abbreviated in the MONTHLY WEATHER REVIEW for July, 1908. The paragraph on p. 206 relating thereto should read as follows:

The damage at Kansas City was very small compared with that caused by the flood of 1903, in fact, the damage to property was very light considering the size of the flood. Twenty-three business institutions in the bottoms, some in Kansas City, Mo., and some in Kansas City, Kans., report a total damage to property of only $91,500. The same number report a total loss by enforced suspension of business of $168,000 and value of property saved by the flood warnings of the Weather Bureau of $1,324,000. These figures multiplied by 10 will, in each case, fairly represent results, making a grand total of damage to property of $915,000 and loss to business of $1,684,000. The value of the Weather Bureau warnings is conservatively estimated at $5,000,000. The railroad losses were only about $350,000.

With this alteration the total losses in the Missouri Valley from Plattsmouth, Nebr., to Boonville, Mo., amount to $10,919,000.—*C. A., jr.*

## THE SCIENTIFIC ASPECT OF A BALLOON VOYAGE.

By H. H. CLAYTON. Dated Bluehill, Mass., September, 1908.
[Reprinted in part from the Boston Sunday Herald, August 9, 1908.]

The trip described below was made from North Adams, Mass, on July 29, in company with Mr. Charles J. Glidden, of Boston.

The morning of July 29 seemed very unfavorable for an ascent at North Adams, Mass., since the sky was covered with a very low sheet of cloud which seemed to threaten rain. By 10 o'clock this stratum of cloud had cleared away. The sun came out, brilliantly hot, causing a rapid rise in temperature. While we were discussing the arrangements for the voyage and the time of leaving, we noticed that clouds such as are usually associated with thunder-storms had already begun to form over the mountains, and it seemed wise to postpone the beginning of the voyage until the late afternoon, a time which Mr. Glidden had previously found to be especially favorable for balloon voyages.

By 1 o'clock the clouds had developed enormous proportions over the Hoosac Mountains, and showed the overspreading tops characteristic of local thunder-storms. Under these conditions it seemed unsafe for a balloon, and the voyage was postponed until the clouds had begun to show signs of disappearing. Finally, at 4:30 p. m., the ascent was begun.

The wind was at the time very light, but showed a prevailing direction from slightly south of west. As the balloon rose it moved with increasing speed directly eastward toward the Hoosac Mountains. After we had risen to a height of about 2,000 feet we were traveling eastward at a speed of about 6 miles an hour.

### THE UPDRAFT.

The temperature at the ground when we left was 86° and already it had fallen about 10°. As we approached the mountain, the balloon steadily rose to a greater height, indicating a strong ascent of air over the peak, where clouds still were seen but of much less proportions than in the earlier afternoon.

As the balloon came near the summit of the mountain it was caught in the whirling vapor and carried upward to a height of about a mile, the ascent being aided, however, by the throwing out of ballast in hopes that we might rise above the top of the cloud. As we approached the cloud the shadow of the balloon was seen distinctly outlined on the ragged mass of vapor, surrounded by rings of colored light.

The updraft over the mountain is indicated in outline in figure 1. This shows the clouds formed in this ascending current, and the balloon at the point of entering the upper portion of the cloud. The observations in the balloon showed that the temperature at this point had fallen to 68°; the clouds were formed by the chilling of the air due to its own expansion and the condensation of the invisible moisture which it contained.

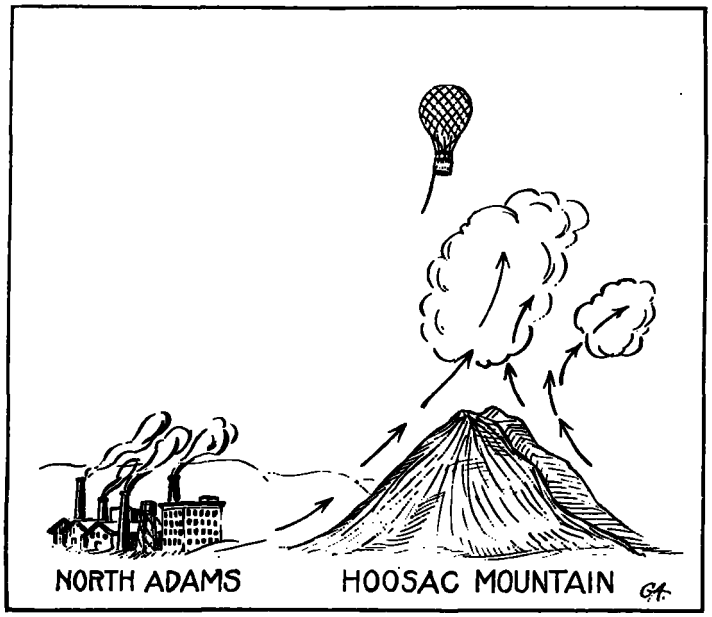


FIG. 1.—The updraft over Hoosac Mountain on July 29, 1908.

As the balloon passed the mountain summit and lost the ascending current which sustained it it began to descend rapidly, because in rising into the thinner air it had lost a part of its gas, which had flowed out at the bottom of the bag. Hence, the bag being unable to support its previous load, it was necessary to throw out sand very quickly to prevent falling entirely to the ground.

Notwithstanding, we fell so rapidly that the sand was past, the balloon dropping faster than the finest grains of sand. The rate of descent was about 6,000 feet a minute. This continued until the trail ropes touched the tops of the trees, after which the balloon, being relieved of part of its weight, floated smoothly along.

### THE PATH OF THE BALLOON.

The path of the balloon from North Adams to its place of landing is shown by the broken line, figure 2. An analysis of this course shows that its bend was due to an indraft of air